

(12) **United States Patent**
Friedrich et al.

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(54) **MAGNETIC FIELD SENSING ELEMENT
COMBINING A CIRCULAR VERTICAL HALL
MAGNETIC FIELD SENSING ELEMENT
WITH A PLANAR HALL ELEMENT**

(58) **Field of Classification Search**
CPC G01R 33/07
USPC 324/251
See application file for complete search history.

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Related U.S. Application Data

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(57) **ABSTRACT**
A magnetic field sensor includes a circular vertical Hall (CVH) sensing element and at least one planar Hall element. The CVH sensing element has contacts arranged over a common implant region in a substrate. In some embodiments, the at least one planar Hall element is formed as a circular planar Hall (CPH) sensing element also having contacts disposed over the common implant region. A CPH sensing element and a method of fabricating the CPH sensing element are separately described.

24 Claims, 8 Drawing Sheets

